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The Persistence of Q-Fever Infection in a Dairy Herd

BY

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SUMMARY.—Cows in a self-contained dairy herd infected with Q-fever were examined at intervals over nearly 4 years. Not more than 15 per cent. of the milk cows showed evidence of infection at any one time, but prolonged excretion of rickettsiae in milk was observed for periods as long as 32 months. Loss of infectivity and complement fixing antibody was observed, and it is suggested that infection is maintained within the herd largely by infection of younger non-immune animals.

Introduction

INVESTIGATIONS of Q-fever in South-west Scotland led to the discovery of a number of infected dairy herds (Grist, 1956). Four of 53 cows in one Stirlingshire herd showed serological evidence of infection; 3 of these 4 animals were in milk, samples of which were found to contain the causal organism, *Rickettsia burneti*. Two of 6 human sera collected from the farm contained antibody indicating previous Q-fever infection. Since these observations were made in May and June, 1955, the herd has been periodically re-examined for evidence of persistence and spread of infection.

Materials and Methods

The herd was self-contained, and numbered about 150 animals of which about 60 were milk cows. Other animals were 1-2 horses, and 25 pigs in May, 1955, but no pigs in January, 1958. The herd had no direct contact with sheep, but over 100 hoggs wintered on adjacent pastures on which the herd grazed in summer; there was no lambing on this ground.

Two methods of laboratory investigation were used to detect Q-fever infection. Blood sera were tested for antibodies by a small-volume complement fixation (C.F.) test with antigen of the Nine Mile strain of *R. burneti* (Grist, 1954). Milk samples were tested for the presence of *R. burneti* by intraperitoneal inoculation into one or two guinea-pigs of the re-suspended deposit after centrifugation of 15 ml. milk at 4,500 r.p.m. for 30 minutes. After about 6 weeks, sera from the inoculated animals were tested for C.F. antibodies. These antibodies were never found in pre-inoculation sera from guinea-pigs; concordant results were always found after inoculating 2 animals with the same specimen; no observation suggested accidental transmission of infection within the animal-house.

Results

Investigations during nearly 4 years are summarised in Table I. Antibody surveys of the milk-cows were made in May, 1955, May, 1956 and January, 1959. In addition to the original 4 seropositive animals discovered in May, 1955, 5 previously seronegative cows had demonstrable antibody in May, 1956, and of these at least 2 were found to excrete rickettsiae in milk. Antibodies were found in a 10th cow, first examined in January, 1959, which had been a young heifer and thus not examined at the previous survey in 1956.

By the tests employed, at any one time not more than 15 per cent. of the cows showed serological evidence of infection. Prolonged persistence of infection, once established in mammary tissues, is illustrated by the infectivity of milk samples taken over periods of 32 months (cow E), 31 months (A), and 15 months (B). Persistence of C.F. antibody was shown for as long as 41 months (A and C) and 31 months (E). Animals A and C ceased to produce infective milk during the

TABLE I
RESULTS OF LABORATORY TESTS FOR Q FEVER

Cow	May 1955, Serum[1]	June 1955, Milk	Jan. 1956		May 1956, Serum[2]	June 1956, Milk	Sept. 1956		Jan. 1958, Milk	April 1958, Milk	Oct. 1958		Jan. 1959, Serum[3]	Feb. 1959, Milk
			Serum	Milk			Serum	Milk			Serum	Milk		
A	+	+	+	+	N.T.	N.T.	N.T.	N.T.	+	–	+	–	–	N.T.
B	+	+	+	N.T.	N.T.	N.T.	N.T.	+	O	O	O	O	O	O
C	+	+	+	–	N.T.	N.T.	N.T.	N.T.	–	N.T.	+	N.T.	–	N.T.
D	+	N.T.	+	–	N.T.	N.T.	N.T.	–	O	O	O	O	O	O
E	–	N.T.	N.T.	(+)	+	+	N.T.	N.T.	+	N.T.	+	+	+	+
F	–	N.T.	N.T.	(+)	+	*	+	N.T.	N.T.	O	O	O	O	O
G	–	N.T.	N.T.	(+)	+	+	N.T.	N.T.	O	O	O	O	O	O
H	–	N.T.	N.T.	(+)	+	–	N.T.	N.T.	–	N.T.	–	–	–	N.T.
I	–	N.T.	N.T.	(+)	+	–	N.T.	N.T.	N.T.	N.T.	–	–	–	N.T.
J	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	N.T.	+	+

[1] 43 others serologically negative.
[2] 45 others serologically negative.
[3] 61 others serologically negative.

+ = Positive result.
(+) = Contributed to positive milk pool from 43 animals.
– = Negative result.
* = Inoculated guinea-pig died—no result available.
O = Animal lost from study through sale or death.
N.T. = Not tested.

period of observation and lost C.F. antibodies within 9 months and 3 years respectively after the first negative milk-sample. Of 3 animals (D, H, I) with C.F. antibodies but no demonstrable infection of the first milk samples tested, none showed infectivity of subsequent milk samples, and two (H, I) were sero-negative when retested after 29 months.

TABLE II
RELATION BETWEEN CALVING DATES AND RESULTS OF MILK TESTS

Cow	Calving	Milk tests June '55	Calving	Milk tests Jan. '56	Calving	Milk tests June '56	Milk tests Sept. '56	Calving	Milk tests Jan. '58	Calving	Milk tests Apr. '58
A	Oct. '54	+	Nov. '55	+	...	N.T.	N.T.	Jan. '57	+	Feb. '58	–
B	Apr. '55	+	...	N.T.	May '56	N.T.	+	May '57	O	O	O
C	Oct. '54	+	Oct. '55	–	...	N.T.	N.T.	Oct. '56; Oct. '57	–	...	N.T.
D	May '54	N.T.	Jun. '55	–	Jun. '56	N.T.	–	...	O	O	O
E	Jun. '54	N.T.	...	(+)	Jan. '56	+	N.T.	Mar. '57	+	Apr. '58	N.T.
F	Sept. '54	N.T.	...	(+)	Nov. '55	*	N.T.	Oct. '56	N.T.	...	O
G	Oct. '54	N.T.	...	(+)	Oct. '55	+	N.T.	Nov. '56	O	O	O
H	Jun. '54	N.T.	...	(+)	Nov. '55	–	N.T.	Mar. '57	–	...	N.T.
I	Nov. '54	N.T.	...	(+)	Mar. '56	–	N.T.	Apr. '57	N.T.	...	N.T.

+ = Positive result.
(+) = Contributed to positive milk pool.
– = Negative result.
* = Inoculated guinea-pig died—no result available.
O = Animal lost from study.
N.T. = Not tested.

Table II shows the calving dates in relation to dates and results of milk tests of 9 cows which had serological evidence of Q-fever at some time. Milk infectivity was found at intervals ranging from less than 1 up to 10 months after calving and exceeding 4 months in more than half the observations. Negative milk tests were found 2 and 3 months after calving of the previously infectious cows A and C.

Discussion

The epidemiological aspects of Q-fever in Britain were discussed in a recent comprehensive review by Marmion and Stoker (1958). Although the disease is widespread in Britain among sheep and cows, the prevalence of infection is very variable from area to area and appears to be relatively low in Scotland (Slavin, 1952; Grist, 1956). As in the case of other rickettsiae, ticks may act as vectors for transmission of infection: *R. burneti* has been isolated from *Haemaphysalis punctata*, but not from *Dermacentor reticulatus* or from *Ixodes ricinus* (Marmion *et al.*, 1953). In Britain it seems likely that infection is more often acquired from inhalation, or possibly ingestion, of Rickettsiae derived from the secretions, excretions, tissues and other products of infected animals. Human infection can follow occupational exposure to such materials, or may result from drinking infected milk or from indirect exposure to the very hardy *R. burneti* which resists drying and may survive for long periods in dust. The risks of serious illness from drinking infected milk may be reduced by the usual presence of antibody in the whey of the same milk (Abiranti & Marmion, 1957).

The present study had several limitations. Firstly, observations were restricted to the milk cows, and no evidence was obtained about possible infection in the bulls or younger animals. Infectivity tests were made by a sensitive method but only a limited number of pooled milks or single samples from indi-

vidual cows at varying intervals were examined. Unless excretion of Rickettsiae was continuous during active infection, false-negative results might thus have been obtained from chance sampling variations. Nevertheless, in all cases where a negative result had been found on retesting milk from a previously infectious cow, or in seropositive cows whose first milk sample was not infected, later milk samples were consistently negative; and no negative results interrupted the series of positives encountered in consecutive tests of cows A, B and E. The C.F. test is sensitive and, suitably controlled, specific; but it may fail to detect all immune animals, whose antibodies may decline to undetectable levels after termination of active infection, a sequence of events which was observed in 4 cows

Sheep have been found a source of infection of man and cattle (Marmion *et al.*, 1954; Marmion & Stoker, 1958). In the present instance, contact between sheep and cattle was remote, and no lambing took place on the farm. Although ticks in the pastures might conceivably have acted as vectors for transmission between sheep and cattle, they appeared to be absent from the farm although *Ixodes ricinus* was common in the adjacent hill country. No other exogenous source of infection was apparent, and on the whole it seems likely that the infection was maintained within the dairy herd itself by spread from one animal to another. Infection of calves by their mothers seems possible, and the 10 animals of Table I include 2 mother-daughter pairs. Infection of adult animals was exemplified by the 5 cows found seronegative in May, 1955 but seropositive a year later, by which time their ages ranged from 5 to 10 years. At least 2 of these animals excreted infected milk in June, 1956. Under Californian conditions, Huebner and Bell (1951) found that 40 per cent, of uninfected cows became infected within 6 months of joining infected herds.

If infection was maintained by spread between adult animals, the situation is paradoxical in that a small minority of animals excreted the very stable infective agent for long periods, yet only a few showed evidence of current or recent infection at any one time. Since 4 cows reverted from seropositive to seronegative condition, it is apparent that a proportion of animals without demonstrable C.F. antibodies have actually experienced infection at an earlier date, and presumably manifest post-infection immunity. Infection may thus be maintained in the herd by spread to susceptible younger animals, the majority of older ones being immune. The figures in Table II did not suggest any special time-relationship between calving and the development of infectivity of milk.

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AGRICULTURAL RETURNS FOR ENGLAND AND WALES

The provisional results of the September, 1959, Agricultural Returns for England and Wales just made available show a slight increase in the number of cows and heifers as compared with September, 1958, and there are more calves on farms. There are more ewes for breeding and more poultry. The decline in the number of pigs for breeding appears to have stopped.

Compared with September, 1958, the total breeding herd (the total of beef-type and dairy-type cows) is slightly up, by 26,000 (0.8 per cent.), whereas numbers had been falling in the previous 12 months. There is also an increase, over the year, of 43,000 (8 per cent.) in the number of heifers in calf (first calf).

The total number of calves under one year old on holdings is 159,000 (9 per cent.) higher than in September, 1958.

The total pig-breeding herd (sows and gilts in pig and other sows for breeding) is about the same as at June, 1959. The decline in breeding herd numbers which had occurred during 1958-9 appears, therefore, to have stopped.

The number of ewes for breeding (excluding shearlings) is 279,000 (4¼ per cent.) up on last September, and there are 137,000 (9 per cent.) more shearling ewes.

There are about 2¼ million (6 per cent.) more fowls of 6 months old and over than a year ago, most of the extra birds being pullets (6 to 12 months old).

In the first results, for September, 1959, there are totals of 15 million young fowls for breeding or egg-laying, 9 million for broiler production, and 5 million for other table poultry.

There are about 800,000 (29 per cent.) more turkeys on agricultural holdings than a year ago. The September, 1959, figure (3.7 million) is the highest number ever recorded.

A Method of Estimating the Formaldehyde Vapour Concentrations Used in Egg Fumigation

BY

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SUMMARY.—It is considered advantageous, in order that hatcheries can be assured of the effectiveness of their routine fumigation processes, that a simple method be available for the determination of the terminal formaldehyde concentrations in incubators or fumigating chambers. Such a method has been described, alternative procedures being provided to suit the particular facilities available and the purpose of the investigation.

FOR the disinfection of eggs by formaldehyde (HCHO) to be effective it is necessary that the concentrations used are adequate for the duration of the period of exposure, which, for practical reasons, does not usually exceed 20 minutes.

Eggs are normally fumigated in incubators or in special chambers, the HCHO required being obtained by the admixture of 40 per cent. w/v formalin and potassium permanganate in the ratio of 3:2. The amounts used are normally based in an arbitrary manner on the volume of the space in which the HCHO is to be liberated. No allowance is made for the space occupied by eggs and fittings, and it is generally accepted that the use of formalin at a rate of 3 to 4½ fl. oz. per 100 cu. ft. provides satisfactory results.

Although the size of the chamber or incubator is the principal factor determining the amount of formalin required, a number of other factors, such as the rate at which the HCHO escapes from the treated space, and the extent to which it is adsorbed by the walls or absorbed by water, also influence the HCHO concentrations obtained (Harry, 1954).

Considerable alteration in incubator construction and design has been made during the last few years, the effects of which, on fumigation procedures, have not yet been completely assessed. Fumigation chambers in contrast to incubators, tend to be more uniform in their design and construction, and thus the experience obtained with one chamber can be directly applied to another. Even with fumigation chambers, however, HCHO concentrations may differ considerably from those anticipated as a result of faulty ventilator louvres or by accumulation of polymerised HCHO on the inner surfaces of the chamber when these are faced with porous material.

For these reasons it is advisable for periodic estimations of HCHO concentrations to be made in incubators and fumigation chambers at the termination of the fumigation period, in order to confirm that adequate levels have been maintained. It was found by Lancaster and Crabb (1953) and Lancaster *et al.* (1954), using the iodometric assay method of Romijn (Walker, 1953), that at incubator temperature the terminal concentration of HCHO for effective 20-minute disinfection, should be not less than 6 to 7 mg. per cu. ft., and at atmospheric temperatures not less than 17 mg. per cu. ft. or 25 mg. per cu. ft. if a 10-minute exposure period is used.

The ability to determine whether or not these concentrations are being obtained is, therefore, of considerable importance to those concerned with the theoretical and practical aspects of fumigation. For this reason the following details are presented of a method of HCHO estimation, which can be adapted for use by hatchery personnel.

(a) Collection of Air Samples and Extraction of the contained HCHO

1. *By means of evacuated flasks.* Samples of air are collected in 500-ml. pressure flasks each fitted with a ground-glass tap mounted in a rubber bung. The flasks, after addition of a measured volume of water (5 to 25 ml.) are evacuated to 60 cm. Hg. The volume of air which each flask will aspirate on release of vacuum is determined initially, and recorded for each completed flask unit, by opening the tap under water and measuring the volume of water which enters (400 to 425 ml.). The air is conveyed from the space being sampled to the flask by means of polyvinyl chloride tubing 1.5 mm. in diameter, the length of which should be sufficient to enable the free end to project more than 30 cm. inside the fumigation chamber. For most purposes no allowance need be made for the volume of air already present in the tube, as this in tubes up to 150 cm. long is less than 0.5 per cent. of the volume sampled. Samples are obtained by releasing the vacuum, the brief collecting time involved enabling rapid changes in the HCHO concentration to be followed. The HCHO in the air sample collected is extracted by the water after shaking the flask gently for 1 minute.

2. *By means of a syringe.* In this method, which is convenient for hatchery use, the flask is replaced by a 20- or 50-ml. syringe. The size of syringe used depends on the concentration of HCHO anticipated. A 20-ml. syringe can be used when the HCHO concentrations are within the range 6 to 46 mg. per cu. ft. (*e.g.* in fumigation chambers), but the larger syringe is required for concentrations in the range 2 to 15 mg. per cu. ft. (*e.g.* in incubators). As the volume of the sample taken (15 or 45 ml.) is relatively small compared with that taken with the flasks, the air contained in the tubing is replaced with that of the space being sampled by means of the empty syringe, before collecting the sample for assay. After being rinsed, 5 ml. of water are with-

drawn into the syringe which is then connected to the tubing. The plunger of the syringe is then withdrawn so as to collect either 15 or 45 ml. of air from the space being sampled. The sample collected is extracted by the water contained in the syringe by shaking, as before, for 1 minute. Duplicate samples should be taken, which, if the technique used is satisfactory, should produce results in close agreement.

(b) Method of HCHO Estimation

The method found to be most suitable for estimating the HCHO content of the sample solutions is a colorimetric one based on that of Denigès (Walker, 1953) using Schiff's fuchsin-bisulphite reagent. It was considered initially that the sensitivity of Schiff's reagent to formic acid, as produced in the initial stages of the reaction between formalin and permanganate, would interfere with the estimation of HCHO by this method and thus render it less reliable than the iodometric method of Romijn which is stated by Borgstrom (1923) to be unaffected by formic acid. A comparison was, therefore, made of the HCHO content of 20 sample solutions, prepared after 10, 20, and 120 minutes from the commencement of fumigation, using both the method involving Schiff's reagent and the iodometric method of Romijn. It was found that both methods gave identical results suggesting that the formic acid produced in the fumigation reaction undergoes rapid decomposition.

The intensity of the colour produced by the reaction of HCHO with Schiff's reagent depends not only on the amount of HCHO present but also on the temperature at which the reaction occurs. For this reason the methods of HCHO estimation with Schiff's reagent previously described (Georgia & Morales, 1926; Evers, 1921), in which the reaction takes place over a brief period at an uncontrolled temperature, involve the simultaneous use of a series of standard solutions. It has been found possible, however, to modify this technique so as to eliminate the influence of temperature variation and thus remove the necessity for the preparation of a series of standard solutions for each estimation. This has been accomplished either by allowing the reaction to proceed to its end point which requires a period of 4 to 6 hours at 25° to 19° C., or by allowing the reaction to proceed at a controlled temperature. In the latter case utilisation has been made of the increase in reaction velocity associated with increase in temperature, to enable concentrations of HCHO as low as 2 p.p.m. to be determined.

The estimation of HCHO is therefore made as follows: 1 ml. of Schiff's reagent is added to the contents of the syringe or to 5 ml. of the solution from the flask. In the case of laboratory investigations, where the probable concentration of HCHO is unknown, a series of dilutions are similarly treated in order to obtain an end point falling on the sensitive portion of the standard curve.

For estimations made at room temperature the containers holding the reacting solutions are stored away from light for 6 to 18 hours. No fading has been found to occur under these conditions. The colour intensities produced are either measured by a photo-electric colorimeter using an Ilford 404 green filter, or are compared with a series of permanent colour standards. The HCHO concentration corresponding to the percentage transmission of the solution is obtained by reference to a standard curve as shown in Fig. 1. The permanent colour standards used, as shown in Table I, cover the range 0.7 to 5.0 μg. per ml. HCHO which corresponds to the limits of the sensitive portion of the standard curve.

TABLE I

COMPOSITION OF COLOUR STANDARDS AND THEIR EQUIVALENT VALUE IN TERMS OF HCHO SOLUTION CONCENTRATION. THE EQUIVALENT HCHO ATMOSPHERIC CONCENTRATION IS SHOWN FOR 15 AND 45 ML. SAMPLES TAKEN BY MEANS OF A SYRINGE USING 5 ML. OF WATER AS A SOLVENT.

Solution No.	$CoCl_2$ Soln. ml.	$CuSO_4$ Soln. ml.	Water ml.	Equivalent HCHO conc. μg/ml.	Equivalent HCHO conc. mg./cu. ft.	
					45 ml.	15 ml.
1	0·8	9·2	0·0	5·0	15·5	46·5
2	0·7	8·0	1·3	4·4	13·6	40·8
3	0·4	6·0	3·6	3·5	10·8	32·4
4	0·2	4·0	5·8	2·4	7·4	22·2
5	0·1	3·0	6·9	1·7	5·2	15·6
6	0·02	1·0	9·0	0·7	2·1	6·3

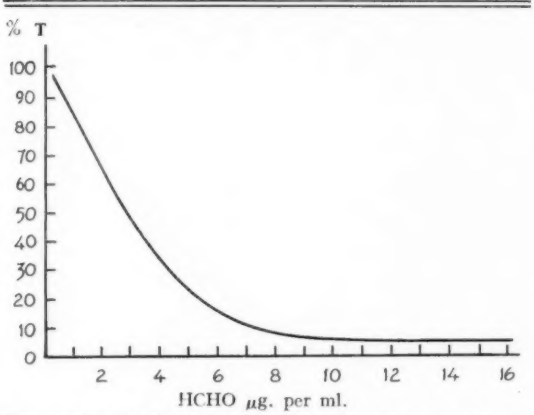

FIG. 1.—Standard curve prepared for a 6- to 18-hour reaction period at 18° to 25° C.

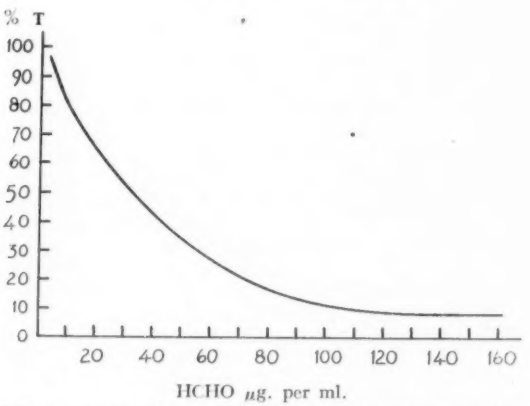

FIG. 2.—Standard curve prepared for a 30-minute reaction period at 37° C.

For estimations made at a controlled temperature the use of a 37° constant temperature water bath and a reaction period of 30 minutes has been found suitable. When using this method of assay the solutions of HCHO are allowed to reach the chosen reaction temperature before adding the Schiff's reagent, which in the case of the 37° water bath requires 10 to 15 minutes. At the termination of the reaction period the colour intensities are measured as before and the concentration of HCHO present is determined by reference to a standard curve prepared for the particular set of reaction conditions used, as shown in Fig. 2. HCHO solution concentrations, in terms of μg. per ml. can be converted to the relative atmospheric concentrations expressed as mg. per cu. ft. by multiplying by the factor $28\frac{x}{y}$ where x is the total sample solution volume and y is the volume of air sampled.

Preparation of Reagent, Standard Solutions, and Colour Standards

(1) *Schiff's Reagent*

This is prepared from the following:—

Rosaniline hydrochloride B.D.H. ...	0.2 g.
Sodium bisulphite solution (S.G. 1.34) ...	10 ml.
Sulphuric acid (S.G. 1.84)	10 ml.
Distilled water	600 ml.

The rosaniline hydrochloride is dissolved in 290 ml. of water with the aid of gentle heat. The solution is cooled and the sodium bisulphite and sulphuric acid are then added in that order. After the solution has been stored overnight in a sealed container, the remaining 310 ml. of water are added, and the last traces of colour are removed by shaking with 1.5 g. of activated charcoal. The reagent is allowed to stand for 5 minutes and then passed through a Whatman No. 1 grade filter until all the charcoal has been removed.

Schiff's reagent prepared in this manner and stored away from light in a stoppered bottle, has been found to be stable for at least two years.

(2) *Standard Solutions*

Dilutions of HCHO for the preparation of standard curves are made from Formaldehyde Solution B.D.H. Analar grade, which has been standardised iodometrically by the method of Romijn (Walker, 1953).

(3) *Permanent Colour Standards*

Colour standards which have shown no change over an 8-month period, have been prepared from solutions of copper sulphate and cobaltous chloride. These solutions are prepared as follows:—

Cobaltous chloride solutions: 4.8 g. $CoCl_2 6H_2O$, dissolve in 5 ml. distilled water, filter, add 1 ml. conc. HCl and dilute to 10 ml.

Copper sulphate solution: 3 g. $CuSO_4 . 5H_2O$, dissolve in 5 ml. distilled water, add 0.2 ml. conc. H_2SO_4 and dilute to 10 ml.

(concluded in adjoining column)

The amounts of these solutions required to prepare the colour standards are shown in Table I, together with the equivalent concentrations of HCHO which they represent. The range of standards shown enable differences of 1 p.p.m. to be readily distinguished by visual examination using a green cellulose acetate filter and viewing against a white background.

Acknowledgments.—The author wishes to thank Dr. R. F. Gordon for the interest he has taken in the investigations described, and Miss J. Standen for her assistance.

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Observations on Horn Cancer in Cattle

BY

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Introduction

ALTHOUGH it is comparatively common in cattle, the cancerous condition of the bovine horn has not attracted the attention of veterinarians to any considerable extent. The malignant lesion at the base of the horn has been reported by Burgraff (1935) in cattle in the East Indies. Lal (1953) recording observations on 6,286 cases of horn cancer in cattle in North India, found that 93 per cent. of the animals affected were working bullocks and the rest cows. Out of this very large number of cases observed by him from 1947 to 1952, not one case in a bull came to his notice.

Clinical Description of Horn Cancer

When presented for treatment the wound is seen to be a soft, lacerated, and bleeding mass of tissue. The animal affected is dull, and inclines the head to the affected side. It tries to scratch the wound with the opposite hind foot and rubs the wound on posts or walls. The wound may extend to the base of the ear which is swollen and soft and may lose its mobility. The parotid and the mandibular lymph glands are swollen and soft. Dried blood and tissue debris hang down to varying distances in the cheek region of the animal, discolouring the face on the affected side. Death in these cases is due to emaciation caused by pain.

Differential Diagnosis Including Horn Fractures and Horn Wounds

Detachment of the horny cover from the corium of the horn very commonly occurs when the animals are involved in a fight. There the entire horny

corium of the horn is undamaged. This condition is easily cured by application of an antiseptic and by keeping the wound covered to avoid contamination.

Fracture of the bony horn core at different levels occurs in many cases. In such cases the best results are obtained by sawing off the bone to make the surface level below the fracture and then cleaning the part well by continuous and thorough irrigation with warm normal saline followed by bandaging the part with a pad of gauze. In these cases healing is prompt unless further infection takes place. Healing may also be quickened by separating the skin at the horn base into flaps, cutting off the horn from the base, and stitching the flaps together, and thus covering the wound. This method gives good results if the wound is fresh and precautions are taken to prevent infection afterwards.

A horn fracture may be presented as a suppurating, maggot-infested lesion, or as a granulating wound if it has been left unattended. Such wounds when properly cleaned and dressed are observed to heal easily unless the damage done is too great. The wounds are cleaned by irrigation with warm normal saline, sawn off to get a uniform surface, and bandaged well with the application of a non-irritant antiseptic. The bandage when removed 3 or 4 days afterwards exposes a uniformly granulating, healthy red surface.

FIG. 1.—Cancerous growth removed from horn base of a nine-year-old working bullock. Horn cavity almost obliterated, visible at the upper part.

If the wound presents an exuberantly growing tissue, with the appearance of small cauliflower-like nodules, the chances are that the wound is cancerous and prognosis in these cases is very uncertain (Fig. 1). This kind of growth may cover the entire surface of the wound or may be limited to one part only. In such cases the cavity at the horn base leading to the frontal sinus and the portions of the frontal sinus nearby are seen to contain nodular, glistening, fatty growths of various sizes which fill the cavity, obliterating the passage. These growths are soft and can be scraped away with a curette. These growths are seen to extend to various distances into the frontal sinus itself.

Histology of Horn Cancer

Tissue preparations from 2 cases were examined. The sections of tissue showed the growths to be ulcerative squamous carcinoma. Masses of irregularly dividing squamous epithelial cells were observed to be lying in a thin masswork of connective tissue amply supplied with blood vessels. Nuclear spindles of dividing cells could be distinguished. Cell-nests were present. Observations by Emslie (1954) on the same tissue sent to him for examination also confirmed the diagnosis (Fig. 2). The cyst-like

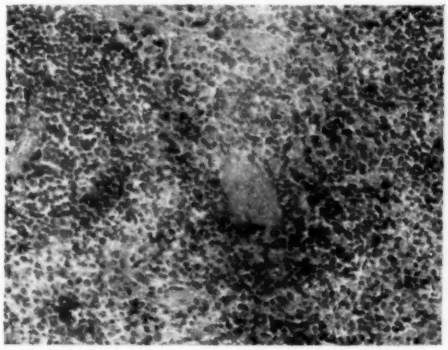

FIG. 2.—Horn cancer. Ulcerative squamous carcinoma. Masses of squamous epithelial cells in clumps. Cell nests visible. ×450.

materials in the frontal sinus cavity were found to be mucoid cysts. This is also the view of Singh (1943) who reported the same findings.

Treatment

1. *Surgical.* In cases where the malignant affection had not penetrated too deeply surgical removal proved successful in attaining a cure. The affected part was shaved and cleaned with soap and water and irrigated for some time to remove any tissue debris. The horn base was then anaesthetised by cornual nerve block. The horn core and the neighbouring affected part was completely removed by sawing the affected tissues. All affected tissues had to be removed completely. The wound was then thoroughly irrigated with warm normal saline, and dressed with a pad of gauze soaked in antiseptic which was anchored to the skin below. The dressing was removed on the fourth or fifth day when a healthy, uniformly granulating wound was seen. In cases where some of the cancerous growth had still been left, exuberantly growing cauliflower-like masses could be seen on the side of the wound. These areas were further excised.

Healing of the wound is by granulation which gradually closes the frontal sinus cavity (Fig. 3). These cases take 1 to 2 months or more for complete recovery. Where the malignant infiltration has descended to the base of the ear the prognosis is very grave as excision of the tissue from these places cannot be undertaken with any safety.

2. *Hormonal.* From the observation that bulls are rarely affected it was thought that the male hor-

(*Concluded at foot of page overleaf*)

An Investigation into the Relationship of Haemolytic *Escherichia coli* to Disease in Pigs

BY

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SUMMARY.—Cultural examination of pigs during routine post-mortem *service revealed that haemolytic* E. coli *was not an uncommon inhabitant of the intestines of pigs of all ages. A high concentration of these organisms, usually found throughout the intestines, could be specifically correlated with a (gastro) enteritis, hitherto undesignated, and occurring chiefly in store pigs. The haemolytic* E. coli *serotypes in such cases were found to belong in the main to 5 serotypes, whereas strains isolated in small numbers from the intestines in other diseases showed much greater serological variety. Clinical and epidemiological data implicated a disease syndrome resembling bowel oedema in many ways, but with oedema as an uncommon* post-mortem *feature. Favourable reports of antibiotic treatment supported the suggested aetiological connexion with haemolytic* E. coli. *An analysis of enteric conditions encountered in routine diagnosis underlined the importance of haemolytic* E. coli *infection in store pig mortality, but indicated that "baby piglet enteritis" is more typically associated with non-haemolytic* E. coli.

Observations on Horn Cancer in Cattle—*concluded*

FIG. 3.—A healthy healing wound at the horn base from which cancerous tissue growths have been surgically removed. The gap of the horn cavity is seen to be closing.

mone might have some effect on the prevention of cancerous growths in the horn base; accordingly, 3 cases were subjected to amputation and administration of male hormone as a therapeutic measure. The affected animals were locally bred Brahmin type working bullocks between 5 and 8 years of age. Complete amputation of suspected cancerous tissue was performed. The wound was regularly dressed and bandaged. Testicular extract was administered regularly on alternate days through the intramuscular route. The extract was prepared by taking about 2 oz. of fresh bull testicles obtained from castration cases. This was minced with a sterile knife, ground well with about 1 oz. of sterile sand in a sterilised glass mortar and pestle. The material was then squeezed through sterile muslin. The liquid obtained was filtered and used for intramuscular injection. It was observed that in cases treated in this way the animals took about 20 days for a complete cure which compared favourably with the time of 1 to 2 months, or more, in similar cases untreated by testicular extract. The progress of a case has been recorded in Table I.

TABLE I

ANIMAL: LOCALLY BRED BRAHMIN WORKING BULLOCK. AGED ABOUT 9 YEARS.

Sept.	20th	Affected horn amputated and dressed. 40 c.c. of testicular extract injected intramuscularly.
,,	21st	Wound dressed, cauliflower-like growths removed by being curetted out. 40 c.c. of testicular extract injected as above.
,,	22nd	Treated as above.
,,	23rd	Treated as above.
,,	24th	Wound only dressed.
,,	25th	Treatment as on 23rd.
,,	26th	Wound only dressed.
,,	27th	Wound dressed, curetted, and 40 c.c. of testicular extract injected as previously.
,,	28th	Wound only dressed.
,,	29th	Wound dressed, curetted, and 40 c.c. of testicular extract injected as previously.
,,	30th	Wound only dressed.
Oct.	1st	Wound dressed and 40 c.c. of testicular extract injected as previously.
,,	2nd	Wound dressed and found to be very healthy.
,,	3rd	Same as above.
,,	4th	Same as above.
,,	5th	Wound dressed and testicular extract injected as previously.
,,	6th	Wound dressed and had healed up closing the gap of the frontal sinus and skin formations had appeared. Animal completely cured.

Acknowledgment.—To Dr. Biswal for facilities provided.

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Introduction

FOLLOWING observation of faecal (Schofield & Davis, 1955) and intestinal (Hudson, Huck, Shand & Buntain, 1951; Gregory, 1955; Lemcke, Bellis & Hirsch, 1957) occurrence of haemolytic *Escherichia coli* in bowel oedema of pigs, further evidence of a direct aetiological connexion has been provided by reproduction of the disease by inoculation of the organisms (Gregory, 1955) or their freeze-thaw products (Erskine, Sojka & Lloyd, 1957; Timoney, 1957; Gitter & Lloyd, 1957), by specific serum neutralisation (Timoney, 1957; Lemcke *et al.*, 1957), and by the high degree of serological uniformity in strains concerned (Sojka, Lloyd, & Sweeney, 1959; Ewing, Tatum & Davis, 1958). Sojka *et al.* (1957) also observed that certain serotypes appeared to be associated with "gastro-enteritis" in pigs. In view of the prevalence of the two conditions (Gracey, 1955; Field, 1957), opportunity was taken during the course of routine diagnosis to investigate the relationship between haemolytic *E. coli* and disease in pigs kept commercially.

Methods

The medium of isolation and haemolytic identification used was 5 per cent. sheep blood agar, and a parallel set of MacConkey plates was also inoculated. The selected sites were seared and penetrated with a straight wire, and the small inoculum well spread over the media. After overnight incubation the volume of growth was recorded as "none," "light," "moderate," or "heavy," and the proportion of haemolytic colonies estimated visually as a percentage. The MacConkey plates served to confirm lactose fermentation. Other coliform characters were checked on representative colonies which were subcultured for submission to serotyping (Sojka *et al.*, 1959).

Drug sensitivity tests were performed using compressed tablets* placed on thickly seeded subculture on 5 per cent. sheep blood agar.

During 1957 the central small intestine and colon as well as organs (heart blood, liver, and spleen) of all pigs examined by the authors during routine *post-mortem* work were cultured for haemolytic *E. coli*. In 1958 the small intestine was divided into two sites, jejunum (3 to 5 feet from the pylorus) and ileum (3 to 5 feet from the ileo-caecal valve) and stomachs were also included.

Results

The Distribution of Haemolytic E. coli *in routine post-mortem specimens*

Most of the growths of *E. coli* obtained from ileum and colon were classed as "heavy," whereas jejunal isolates, if any, tended to be "moderate" to "heavy," and stomach and organ ones "light."

The site occurrence of haemolytic *E. coli* in different age groups is shown in Fig. 1 where examinations of organs and colon for 1957 and 1958 are combined because of their close similarity. Both incidence and concentrations appeared to increase with age, and were highest in colon. Similarity of jejunum and ileum results suggested a general distribution throughout the small intestine consistent with an upward invasion. Infections of organs were uncommon.

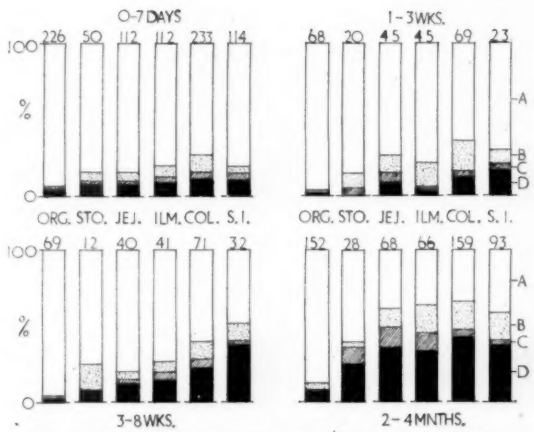

FIG. 1.—THE AGE INCIDENCE AND DISTRIBUTION OF HAEMOLYTIC *E. coli* (HC) IN ROUTINE *Post-mortem* EXAMINATIONS:
A. Cultures *Negative* for HC
B. Cultures with 1 to 25 per cent. HC
C. Cultures with 25 to 75 per cent. HC
D. Cultures with 75 to 100 per cent. HC
Figures refer to the number of examinations.

Diagnostic Association

An analysis (Fig. 2) was made of diagnoses in individual pigs of the different ages in relation to "non-specific enteritis." This was offered as the diagnosis when there was a history of scouring and/or enteritis at autopsy, without implication of specific causes such as swine fever, paratyphoid (*Salmonella cholerae-suis* infection), necrotic enteritis, etc., and *without* any other visible cause of death.

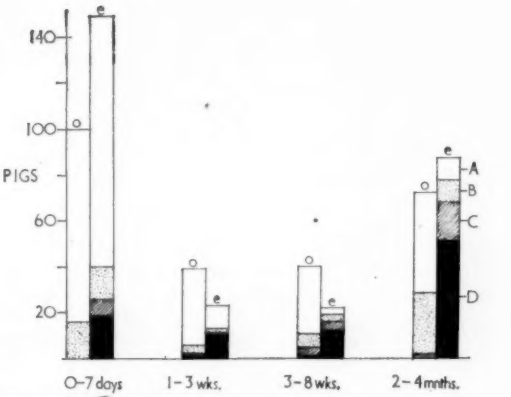

FIG. 2.—THE INCIDENCE OF HAEMOLYTIC *E. coli* IN "NON-SPECIFIC" ENTERITIS (*e*) COMPARED WITH THAT IN ALL OTHER DIAGNOSES (*o*):
A. Cultures *Negative* for HC
B. Cultures with 1 to 25 per cent. HC from *any site*
C. Cultures with 75 to 100 per cent. HC from *one site*
D. Cultures with 75 to 100 per cent. HC from *more than one site*.

* "Sentests," Evans.

In the younger 3 age groups such "specific" enteritis was diagnosed in less than 2 per cent. of cases whereas they accounted for almost half of the "other conditions" in the 2–4 month group.

There was a relatively high incidence of "non-specific enteritis" in both 0–7 day and 2–4 month age groups, but only the latter could be related to a high level of haemolytic *E. coli*. The character of the "non-specific enteritis" between 3 and 8 weeks closely resembled that between 2 and 4 months whereas in the 1–3 week group haemolytic *E. coli* were less prominent. The "specific" enteric conditions were *not* associated with haemolytic *E. coli*. The small proportion of probably significant levels of haemolytic *E. coli* in the "other" section (Fig. 2) was in individual pigs with lesions of such varied conditions as acute pneumonia, exudative dermatitis, and swine fever.

Serological Evidence.

Table I shows the age incidence in 101 separate outbreaks, each represented by the examination of one or more pigs, from 35 veterinary practices, of disease in which haemolytic *E. coli* could be regarded as significant. In two-thirds of the examinations the organisms were obtained in virtually pure culture from at least two sites and in the remaining third from at least one alimentary site (usually colon). The serotyping results are compared with 72 strains regarded as not significant, having been obtained in less than 25 per cent. purity from not more than one site in 72 pigs.

All ages were involved but particularly the 2–3 month group. One serotype (OKE 68) was by far the most frequent of "significant" isolates, and was well represented in the "non-significant" section. The 5 commonest serotypes accounted for 81 per cent. of the former and about 30 per cent. of the latter. While only 9 per cent. of the "significant" serotypes could not be typed, 43 per cent. of the "non-significant" were "untypable."

Post-mortem *Findings*

The records on 146 animals from the 101 outbreaks in Table I show that enteritis was the commonest feature (90 outbreaks). Oedema accompanied enteritis in 6 and in a further 7 was the chief *post-mortem* finding, the remaining 5 examinations revealing no lesions. The enteritis involved the small intestine and varied in severity from barely perceptible to obvious with blood-tinged contents, but was never a severe haemorrhagic type. Gastritis accompanied the enteritis in the majority of animals but was not invariable. This feature appeared to be more common in piglets less than a week old when haemolytic rather than non-haemolytic strains of *E. coli* were involved. The stomach was usually full and the fundic region darkly congested with tenacious mucoid surface deposit. The large intestine was not directly involved, sometimes containing dry firm faeces, but more often being empty or with liquid contents indicating scouring or incipient scouring. Oedema, when present, was found chiefly in the stomach wall and/or colonic mesentery. In 9 of the 13 cases of such oedema, the serotype isolated was OKE 4(5) and OKE 68(4).

Clinical History

As might be expected from the incidence of

TABLE I
THE AGE INCIDENTS OF OUTBREAKS AND THE DISTRIBUTION OF HAEMOLYTIC *E. coli* SEROTYPES

	Significant Isolates								Non-Sig.
Ages	0 to 3 days	4 to 7 days	1 to 4 weeks	4 to 8 weeks	2 to 3 months	3 to 4 months	4 to 8 months	Totals	Isolates
Outbreaks	17	3	15	12	38	14	2	101	72
Serotypes									
E 68	10	1	4	5	21	7	1	49	6
G 7	4	2	3			1		10	0
E 4				1	4	3		8	6
E 57			2	1	5			8	7
E 65				1	3	1	1	6	2
E 145				1	1			2	2
G 11					2	1		3	1
G 12			1					1	3
E 29					1			1	2
O 2					1			1	
G 60			1					1	
RVC 1034			1					1	
E 148	1							1	
F 21									2
X 96									5
M 317									2
M 434									1
F 16									2
Not Typable	2		3	3		1		9	31

enteritis on *post-mortem* examination, afebrile scouring, though not necessarily the first sign of trouble, was the commonest complaint recorded for at least 55 outbreaks, accompanied by the nervous symptoms of bowel oedema in 12, the latter alone being mentioned in a further 15, and animals said to have been found dead in another 12. In less than half of the cases in which nervous symptoms had been noted was oedema found on autopsy, and in 2 of these cases no lesions were evident.

The onset of illness was rapid and the course typically short. In the 42 outbreaks for which information on this point was available death was "rapid" in 18 (including many cases "found dead") and was observed in less than 12 hours (5 minutes to 12 hours) in 5, in less than 24 hours in 11, 2 days in 4, and longer in 3 only.

The *mortality rate* tended to be highest in young pigs, averaging, for example, 50 per cent. in 13 outbreaks in piglets less than 1 week. Excluding these, the rates in 46 outbreaks averaged 20 per cent. On 10 farms single deaths only occurred, and subtracting these, the average was 22 per cent. with range of 10 to 60 per cent. Information from 13 farms revealed an average morbidity rate of 39 per cent. of the affected group. Follow-up enquiries elicited practically identical figures showing that most of the deaths occurred on the first day, and that, through treatment or naturally, there was no marked extension of morbidity beyond a comparatively short period.

Epidemiology

On 11 premises there was a serious sucking-pig mortality problem and, in a further 4, deaths in the piglets accompanied malaise and agalactia in the sows. In older pigs, a recent change in management was a very common history, and the high incidence post-weaning is noteworthy in this respect. The commonest time between change and disease was 7 to 14 days, this period being recorded, for example, in 10 out of 12 outbreaks where pigs were known to have been purchased and 8 out of 10 with a definite weaning association. However, in the 7 outbreaks affecting piglets known to have been early-weaned between 2 days and 4 weeks, there was no such time relation to weaning. In at least 5 outbreaks a recent change in diet had occurred.

Both on the 11 premises with a serious sucking-pig mortality problem, and on 8 farms with recurrent sporadic outbreaks in older pigs, it was usual for the same serotype to be recovered repeatedly over a period.

On 5 farms a total of 42 faecal swabs from penmates of affected pigs were examined for haemolytic *E. coli*. 31 gave the organism exclusively, the percentage purity in the remainder being 25 to 75 in 6 and under 25 in 5. Moreover within each outbreak all strains examined were of the same serotype corresponding to that obtained from carcase specimens. On the other hand, 21 out of 25 faecal swabs from comparable normal pigs in other pens on the same premises revealed no haemolytic *E. coli*, the remaining 4 showing serotypes usually different and variable.

Treatment

Drug sensitivity tests on the 101 "significant" haemolytic *E. coli* isolates gave the following results:—

Drug	Tablet concentration	Percentage completely resistant	Percentage comparatively resistant
Streptomycin	80 μg	2	0
Tetracyclines (Oxy-and chlor-)	100 μg	17	13
Chloramphenicol	100 μg	0	0
Sulphonamide (Sulphafurazole)	1mg.	1	0

Substantially similar results were obtained with "non-significant" cultures.

Practitioners' reports on treatment were generally favourable for those antibiotics to which isolates were sensitive, streptomycin being the most commonly used drug.

General Incidence

An analysis (Table II) of *post-mortem* diagnoses at this laboratory for 1958 in relation to enteric conditions, bearing previous evidence in mind, points to their great importance in pig disease and underlines the rôle of haemolytic *E. coli* infection in store pig mortality. It also implicates non-haemolytic coli as the main factor in baby piglet enteritis and reveals an inverse relative incidence with age between haemolytic *E. coli* and non-haemolytic *E. coli*.

Discussion

Haemolytic ability in *E. coli* is generally considered to be related to pathogenicity. The character was quite stable through several subcultures in all strains encountered and proved an invaluable basis for identification and estimation of the purity of the primary growths. In animals freshly dead of non-enteric conditions *E. coli* appears to be confined to ileum and large intestine and is predominantly non-haemolytic with haemolytic types not uncommon. The gross alterations observed in this distribution and these relative proportions, with the presence of large numbers of haemolytic *E. coli* in the upper intestine, implied a pathogenic significance that could be correlated with an enteritis which was the only or main *post-mortem* feature. The specificity of this relationship tended to be confirmed by the demonstration that the serotypes so implicated were limited in number whereas strains isolated in small numbers in other circumstances were of much greater serological variety.

The 5 main serotypes revealed in the present investigation, mainly in association with gastro-enteritis, corresponded to the dominant serotypes shown by Sojka *et al.* (1957, 1959) to be concerned in bowel oedema and "gastro-enteritis." This similarity in serotype pattern inferred a common basic aetiology. Evidence in support of this view was afforded by the close clinical and epidemiological resemblance of our outbreaks of gastro-enteritis to

TABLE II
THE AGE INCIDENCE OF VARIOUS ENTERIC CONDITIONS

		3 days	3 to 7 days	1 to 3 weeks	3 to 8 weeks	2 to 4 months	4 to 8 months	Total
A.	Outbreaks	64	24	48	58	125	20	335
B.	Enteric conditions (per cent. of A)	64	67	54	47	76	45	64
C.	Non. haem. *E. coli* (per cent. of B)	80	81	38	15	—	—	
	Haemolytic *E. coli* ,, ...	17	19	35	63	63	56	
	Paratyphoid (*S. cholerae-suis*) ,, ...	3	—	—	—	6	—	
	Necrotic Enteritis (not due to Salmonella) ,,	—	—	—	3	11	—	
	Unknown/Other (per cent. of B)	—	—	27	19	20	44	

Note.—The figures include a small proportion with generalised infections of considered enteric origin.

the original description of bowel oedema (Shanks, 1938). It is also consistent with the recognised inconstancy of oedema in bowel oedema (Timoney, 1957) and the occurrence of a gastro-enteritis with a history typical of bowel oedema (Lamont, Luke & Gordon, 1950). The pathogenesis would appear to involve environmental factors predisposing in some way to pathogenic multiplication of haemolytic *E. coli* present in the intestine in small numbers leading to a rapidly fatal intoxication with gastro-enteritis and/or oedema as local manifestations. The character of such local lesions cannot be clearly related to serotype since, although Lloyd (1957) suggests that OKE 4 may be more specific to bowel oedema, he also indicates that the frequently encountered serotype OKE 68 and OKE 57 may occur with either lesion. To regard both conditions as manifestations of haemolytic *E. coli* infection under the term "Colitoxicosis" may then be both justifiable and convenient.

The circumstances under which enteritis occurred in baby pigs differed from those in older pigs. Most of the enteritis in this age group appeared to be associated with non-haemolytic *E. coli* and there was no particular distinguishing historical or clinical feature in outbreaks involving haemolytic *E. coli*. In these instances as in the outbreaks investigated by Saunders *et al.* (1959) the main serotypes were OKE 68 and OKG 7 and the limitation of the latter to this age group offers an explanation of Lloyd's (1957) other observation that OKG 7 is specific to "gastro-enteritis."

Benefit from treatment would depend on reduction or elimination of the haemolytic *E. coli* population. There is experimental evidence (Lloyd, 1957) that this does occur and that cases may be prevented. It would be reasonable to suppose that the good reports of field treatment resulted from a similar effect as long as the danger of ascribing too much to treatment in a disease of short duration and limited mortality is borne in mind. Tetracycline-resistant strains were common enough for some to consider the use of these drugs as leaving too much to chance, and it might be expected that such strains may become commoner as a result of antibiotic feeding (Smith & Crabb, 1957).

Acknowledgments.—We are indebted to Messrs. W. J. Sojka, M. K. Lloyd, and E. G. Sweeney for the serology. Acknowledgments are also due to the practising veterinary surgeons in our area for co-operation, to Mr. S. G. Harrison for his technical assistance, and to Mr. H. I. Field for his interest and advice in the preparation of this paper.

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ANTIBIOTICS AND MILK

A new clause has been added to the contract between milk producers and the Milk Marketing Board. It specifies that milk shall not be delivered to the Board from any cow that has had its udder treated with antibiotics less than 48 hours previously.

Before this alteration, which took effect on November 1st, the contract simply said that no milk should be delivered while the cow was undergoing treatment. The Board has introduced the time factor in an attempt to prevent a serious problem arising, such as has been encountered elsewhere, for example in the United States.

A significant difference between the two countries is that in Britain penicillin is supplied only on a veterinary surgeon's prescription, whereas in America it is freely available to farmers.

Embryotomy in the Ewe

BY

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A STUDY of the growing literature on obstetrics in the ewe reveals little interest in embryotomy. Hughes Ellis (1958), in the most comprehensive essay to date on ovine obstetrics, tells us that during a 10-year period of treating 1,200 cases of ovine dystocia. "It was not found necessary or advisable to resort to embryotomy. . . ." This attitude seems to typify the common practice of the majority of veterinary surgeons doing ovine obstetrical work in Britain and Australia.

It may be due mainly to the fact that it is necessary to have a smaller than average hand to get results from embryotomy comparable with those from caesarean operation. But the truth is that on occasion, and given a small hand, embryotomy in the ewe can be, if not necessary, then certainly advisable and much better in the long run than caesarean section.

For example, Blackmore, in a letter to THE VETERINARY RECORD of November 26th, 1958, whilst justly applauding the work of Hughes Ellis is moved by a sense of vital omission in the article to draw attention to a simple act of embryotomy which, as he implies, is sometimes by far the best thing to do.

That is the removal, after subcutaneous skinning, of one or both fore legs in that type of case where the legs alone of a dead foetus are projecting at about knee level from a vagina and uterus, so dry and contracted that retropulsion is impossible, short of killing the ewe. Those of us who commonly do this simple form of embryotomy know that once the barrier of one or both fore legs is completely removed, the head can usually be reached by a small hand and the residue of the foetus safely removed by traction on the head.

The method described by Mr. Blackmore, however, of just "pushing the skin" back up the leg is not always possible in an impacted case, and is not radical enough to ensure that the leg can be drawn out through the skin without breaking the limb in two at the shoulder joint and leaving the scapula *in situ*. Also a dangerous amount of force may have to be used.

Radical Technique For Removing Fore-legs

A safer and more effective method is based on the technique described for the calf by Benesch and Wright (1950), except that domestic knives are substituted for the much too big spatula of Kellner, used by Benesch for calves and foals. An ordinary all-metal table or dinner knife with a 5-inch blade is used to separate the skin as far past the elbow as the knife will go. Then a type of ham-slicer knife of English origin with a flexible 9-inch blade, ¾ inch wide, is used to continue the subcutaneous skinning to the top of the scapula.

Both knives have rounded ends and all sharp edges are blunted by filing. It may be asked why 2 knives are used when the longer one should suffice. The reason is that the more rigid blade of the shorter knife is needed to force a way under the tightly held skin of the lower part of the limb. When that obstacle is overcome the more flexible blade of the longer knife is needed to negotiate the contours of a shoulder tightly pressed in a contracted uterus.

After such thorough and necessary preparation the entire limb can be drawn through the skin with relative ease and certainty.

A Suitable Embryotome

Other embryotomy in the ewe is carried out with small-calibre embryotomy wire of the cable type, passed through one of the two detachable tubes taken from the Liess modification of the Thygesen embryotome. It is usually possible to pass the wire around the part to be severed without using an "introducer," but if such a help is needed it can easily be made by welding ⅛-inch steel rod into a loop about 2 inches long and as wide as the end of the middle finger.

On occasion a vulsellum forceps serves admirably to bring up the head or other part jammed too tightly in the uterus to pass a cord around it. The forceps is fixed as high as possible in the upper jaw because the lower jaw is too fragile to stand a strong pull.

A Gunther's embryotomy hook knife has been found the best instrument to open a cystic or dropsical foetal abdomen in the rare instances when such a condition is a complete impediment to delivery. We should all agree with Hughes Ellis about the way a ewe should be held when correcting dystocia, but the task for one's helper can be made less tiring by attaching the ends of a short piece of ¼-inch rope to each hind leg and passing the loop thus formed around the man's shoulders. In a long operation with a heavy ewe this can be a real boon.

Instead of the liquid paraffin advocated by Hughes Ellis I use freshly boiled linseed mucilage, seeds and all. It is less messy than oil and seems to be a better lubricant at the temperature of the body. It is also much cheaper here.

For the rest one depends on a small hand, practised manipulation, avoidance of rough handling, and an intramuscular injection as soon as the operation is over of 2,000,000 units of crystalline penicillin. It has been proved after long use that a ewe, however small, can tolerate 2,000,000 units of penicillin. It has not been found that placing antibiotics in the uterus makes any obvious difference to results, but there has been ample evidence of the value of massive intramuscular doses of penicillin in fresh cases. In cases which are not fresh, where there is

already some toxaemia, antibiotics appear to be quite useless; and one endeavours to avoid operation on such forlorn hopes, if only for the sake of the unfortunate ewe.

Embryotomy and Caesarean Operation Compared

Under the good conditions for fine surgical work, such as practitioners to-day in Britain must often enjoy to get the remarkable results they claim, the caesarean operation in difficult ovine dystocia is clearly the means of choice.

But under Tasmanian conditions we cannot as a rule hope for anything like the British results from caesarean operation, and so (except for the odd live lamb that might have been saved by this method) embryotomy can give the man with the small hand much better results. Indeed, if embryotomy is carefully done in a fresh case there should as a rule be no trauma that could kill the ewe. Any possible recent infection is taken care of by the large injection of penicillin, with results that are even better than the 75 per cent. success obtained by Hughes Ellis in his 69 caesarean operations.

Operation For Ring Womb

Consequently it is only in the condition known as ring womb that one now considers doing the caesarean operation. But in ring womb too embryotomy has a useful part to play if one elects to try section of the dorsal arc of the cervix as described recently by P. H. Malone in the *New Zealand Veterinary Journal*.

I have tried this operation on 3 ewes.* In the first 2 cases the constricting cervical band was near the vulva and easily divided with a minimum of tissue damage by long-bladed scissors. But, as reported by another writer in THE VETERINARY RECORD, it was found that even after section of the cervix much had to be done to extract the dead lamb. Both fore legs had to be removed as described above. Both ewes recovered after the usual 2,000,000 units of penicillin. In the third ewe the "ring" or unopened cervix was far forward in the abdomen, and section at such a distance proved most difficult. There was much haemorrhage, and in trying to manipulate 2 dead twin lambs the uterus was torn near the divided cervix to such an extent that the operation was stopped and the ewe was slaughtered. Here is one type of case at least in which the caesarean operation alone could succeed.

Decapitation in Uterus

Finally, here is a procedure in ovine obstetrics that may be trusted to save a higher proportion of viable ewes to which the method applies than could any other, including hysterotomy, in the present state of our veterinary practice.

The rule is to proceed at once by wire embryotome to decapitate *in situ* the lamb in those dystocias where even a small and well-lubricated hand passes with difficulty through vagina and cervix to find a moribund foetus bunched up in semi-fore presentation in a small or contracted uterus.

The severed head is then extracted—by vulsellum forceps if necessary—and the residue of the foetus safely delivered, after lavish lubrication, by means of cords attached by slip knot to the fore legs.* In such dystocias there is not enough room to bring the head and fore legs safely together into the pelvis, and it is impossible as a rule, without rough and dangerous handling, to drag the head alone outside the vulva for purpose of decapitation there. Consequently the above stated rule is the only safe alternative to the caesarean operation in these cases, and, on statistical grounds, the means of choice for the small-handed obstetrician.

An Obstetrical Use for the Vulsellum Forceps

Subject to two simple precautions—stated below—the 17-inch single-pronged Neilson vulsellum forceps has been found to be a safe and effective aid for extracting the foetus or part of it when space is lacking for manual guidance of the fore parts into and through the pelvic canal.

Firmly fixed in the upper jaw, it extends the head and neck, when pulled in a straight line, similar to the action of the twin eye hooks in delivering the calf.

This greatly facilitates extraction of the head—an essential first step in many difficult dystocias of the ewe.

The commoner device of a cord or plastic-covered wire around the neck tends, when there is very little room, to deflect the head and to the employment of a dangerous amount of force and fumbling.

Fixed to the end of the neck-stump of a decapitated lamb, the forceps facilitates delivery to a remarkable extent when pulled at the same time as one or both fore legs.

The two precautions necessary to safeguard both the ewe and a live lamb are: (1) In attaching the forceps to the foetal head the prongs must be guided by the left hand to take a deep grip of the upper jaw. This prevents the tearing of foetal tissues which alone can endanger the live lamb.

(2) Before exerting traction, the hand must be between the wall of the uterus and the part of the foetus held by the forceps to ensure that no maternal tissue is included in the grip.

References

BENESCH & WRIGHT (1950). "Veterinary Obstetrics."
BLACKMORE, D. K. (1958). *Vet. Rec.* **70.** 1,002.
ELLIS, T. HUGHES (1958). *Ibid.* **70.** 952.
MALONE, P. H. (1957). *N. Zealand Vet. J.* **5.** 114.

* Three more cases have recently been operated on successfully by this method.

* Owing to there being so little room it is absolutely necessary to hold the stump of the neck in line, either by hand or vulsellum forceps, when drawing the trunk of the foetus into the pelvis of the ewe. Otherwise the bent-back stump forms an insuperable obstacle to delivery in the above form of dystocia.

News and Comment

THE BRITISH VETERINARY POULTRY ASSOCIATION

The summer meeting of this association was held at the Harper Adams Agricultural College, Newport, on Tuesday, July 28th, 1959. Mr. N. Dobson, President, was in the chair and welcomed a good turnout of members at the annual general meeting which preceded the scientific session. A special welcome was extended to Dr. H. Temperton, to whom the President conveyed the thanks of the members for the facilities extended to them.

The Minutes of the last meeting, which had been previously circulated, were passed.

The following office bearers were elected:—

President, Dr. J. E. Wilson; *Vice-President*, Dr. W. P. Blount; *Secretary*, Mr. J. M. S. Lucas; *Treasurer*, Mr. R. H. Axworthy; and *Committee Member*, Mr. W. E. Beattie.

Following the business meeting, members were welcomed to the Institute of Poultry Husbandry by Dr. H. Temperton who described the work being carried out by his staff. Members were then taken on a tour of the Institute and saw poultry kept under different systems of management, both conventional and experimental.

In the afternoon a paper, illustrated by coloured slides, was given by Mr. Cyril Thornber on "The Breeder's Part in Poultry Disease Control." He described the genetical detail involved in the production of a new line and the investigations into poultry blood groups and associated characteristics.

FOWL PEST

A Ministry of Agriculture notice states that a serious epidemic of fowl pest has hit poultry-producing areas in central and eastern England, and is giving cause for concern.

Restrictions on the movement of live poultry are now in force in parts of Norfolk, Gloucester, Oxford, Worcester, Warwick, Wiltshire, and Lincoln (Kesteven), together with the whole of Cambridge, including the Isle of Ely, and the whole of Huntingdon. Outbreaks have also been confirmed recently in 20 other counties of Great Britain. The series of fowl pest outbreaks in Scotland, however, is now believed to be under control. There were 188 outbreaks of the disease in October, and 110 between November 1st and 9th.

THE SUPPLEMENT

The current Supplement to THE VETERINARY RECORD is now in course of preparation. Honorary secretaries of Divisions, and others who have material for publication, are asked to be good enough to send it to the Editor within the next two weeks.

HOLIDAY EXCHANGE

Dr. Heinen, a German veterinary surgeon, wishes to bring his twelve-year-old son to England for a holiday in July, next year. He would like either to exchange hospitality with a British colleague, or pay for accommodation as may be preferred. Any reader who wishes to follow up this suggestion is asked to write to Dr. Heinen direct. His address is: Oberhausen Rhineland, Winkelried Strasse 26.

UNIVERSITY NEWS

Liverpool

At its meeting held on November 10th, 1959, the Council of the University appointed Mr. A. Knifton, B.V.SC., B.SC., M.R.C.V.S., to the vacant lectureship in veterinary pharmacology as from December 1st, 1959.

PERSONAL

Mr. Norman Comben has resigned his appointment as Principal of the Advisory Department of the Animal Feeds Division of Quaker Oats Ltd., and has joined the Veterinary and Farm Sales Division of Bayer Products Ltd.

Engagement

MCCAIG—SPALDING.—The engagement is announced between John, the only son of the Rev. A. E. and Mrs. McCaig of the Vicarage, Swanmore, Southampton, and Gillian, the younger daughter of the late Mr. and Mrs. H. H. Spalding of Tregonwell, 81, Freehold Road, Ipswich.

Births

BOYD.—On August 1st, 1959, to Gillian (*née* Minns), wife of James Boyd, B.V.SC., M.R.C.V.S., of The Close, Babraham, Cambridge, a second son, Peter Matthew.

CORRIGALL.—At the Mowat Nursing Home, on November 6th, 1959, to Marion, wife of William Corrigall, M.R.C.V.S., Dunella, Stonehaven, a son, Rognvald Sutherland.

PYM.—On October 18th, 1959, to Caroline Pym, B.V.SC., M.R.C.V.S. (*née* Clark), and Michael Pym, Tower House, Malmesbury, Wiltshire, a son, Hugh Ruthven.

R.C.V.S. OBITUARY

We record with regret the deaths of the following members of the profession:—

RALSTON, A. G., Brigadier, of Colonsay, The Crescent, Farnborough, Hants., formally Director of the Army Veterinary and Remount Services. Graduated July, 1926, at the Royal (Dick) Veterinary College, Edinburgh, died November 11th, 1959, aged 55. The funeral was held at St. Andrew's Church of Scotland, Aldershot, on Monday, November 16th.

MORGAN, Dr. Daniel, on November 17th, 1959, at Addenbrookes Hospital, Cambridge. Dr. Daniel Owen Morgan, aged 66 years, was University Lecturer in Animal Pathology (Parasitology), School of Veterinary Medicine, University of Cambridge and formerly Senior Lecturer, University of Edinburgh.

at 2 p.m., followed by cremation at Woking. The British Veterinary Association was represented by Brigadier J. Clabby, M.B.E.

COMING EVENTS

November

25th (Wed.). Annual Supper Dance of the Scottish Metropolitan Division at the Carlton Hotel, North Bridge, Edinburgh, 8 p.m.

26th (Thurs.). Meeting of the B.V.A. Overseas Committee at 7, Mansfield Street, London, W.1, 11 a.m. Meeting of the Supplementary Veterinary Register Association at 7 Mansfield Street, Portland Place, London, W.1., 2 p.m.

27th (Fri.). Annual Dance of the Northern Ireland Veterinary Association in Thompson's Restaurant, Callender Street, Belfast, 11.30 p.m.

Annual Ball of the Royal (Dick) Veterinary College Rugby Club in the Adam Rooms, Edinburgh, 9 p.m.

28th (Sat.). Meeting of the Metropolitan Region of the B.S.A.V.A. at 1, Wimpole Street, London, W.1; dinner 7 p.m. for 7.30 p.m.; paper 9 p.m.

December

2nd (Wed.). Meeting of the Society for the Study of Comparative Medicine in the Lecture Theatre, School of Veterinary Medicine, Madingley Road, Cambridge, 8.30 p.m.

3rd (Thurs.). Meeting of the West of Scotland Clinical Club at the University Veterinary School, 83, Buccleuch Street, 7.30 p.m.

4th (Fri.). General Meeting of the South Wales Division at the Park Hotel, Cardiff, 2 p.m.

6th (Sun.). Meeting of the Kenya Veterinary Association at Uplands Bacon Factory and Sports Club, 11 a.m.

9th (Wed.). Meeting of the Southern Counties Veterinary Society at the Conference Room, Civic Centre, Southampton, 7.30 p.m.

11th (Fri.). 11th Meeting of the British Veterinary Poultry Association at Unilever House, London, 2.15 p.m.

17th (Thurs.). Meeting of the South Eastern Veterinary Association at the Royal Star Hotel, Maidstone, 2.30 p.m.

January, 1960

20th, 21st and 22nd (Wed., Thurs. and Fri.). B.V.A. Committee and Council Meetings in London.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Durham. Baal Hill Farm, Wolsingham, Bishop Auckland (Nov. 11).

Northants. Rectory Farm, Warmington, Peterborough (Nov. 11).

Renfrew. Railway Fields, Barcaple House, Newton Mearns, Glasgow (Nov. 12).

Somerset. Moorfields, Back Weir, Gedney Road, Glastonbury (Nov. 12).

Stirling. Polmont Side Farm, Brightons, Falkirk (Nov. 12).

Lanarks. Corra Farm (Nov. 16).

Perth. Rosemount Farm, Blairgowrie (Nov. 16).

Fowl Pest

Beds. 200, High Street, Clapham (Nov. 10); 174, High Street, Clapham; Rookery Road, Wyboston; C4, Great Norton Road, Chawston (Nov. 11); 13, Rookery Road, Wyboston (Nov. 12); 44 Holding, L.S.A., Rookery Road, Wyboston; Bluebells Chawston (Nov. 13); The Croft, Great North Road (Nov. 14).

Berks. Hatch Farm, Padworth, Reading (Nov. 14).

Bucks. Brook End, Weston Turville, Aylesbury (Nov. 16).

Cambs. 13, Cootes Lane, Fen Drayton; 52, Station Road, Haddenham, Ely; 14, Cootes Lane, Fen Drayton; 27, Cootes Lane, Fen Drayton; 49, Middleton Way, Fen Drayton (Nov. 10); 15, Westfield Road, Manea, March; Duxford Grange Farm, Duxford; Bedwell Hey, Little Thetford, Ely (Nov. 11); Flexon Poultry Farm, Wilburton, Ely; Bink Farm, Waterbeach; Priest Lane, Smallholdings, Willingham; 200, High Street, Cottenham (Nov. 12); The Bungalow, Cambridge Road, Ely; Norris Farm, Willingham; Chorley, Cow Lane, Rampton; Sand Lane, Aldreth, Haddenham, Ely; The Rookery, Bourn (Nov. 13); 16A, Lower Road, Stuntney, Ely; 1, Hallfield Terrace, Stuntney, Ely; Great Close Farm, Barton; 7, Earith Road, Willingham; Sand Lane, Aldreth, Haddenham, Ely; 8, High Street, Cottenham; 14, Mill Lane, Histon; 20, Mill Lane, Histon; Brooklands, Cottenham; Hemington's Lane, Willingham Road, Over; Crow End Bourn; Garden Court Over (Nov. 14); 40, Mill Lane, Histon; Smallholding, Willingham Road, Over; Redroofs, Little Thetford, Ely; Canbury Farm, King Street, Over (Nov. 15); 129, Main Street, Witchford, Ely; 16, Mill Lane, Histon; 211, West End, March; Hillside, Coton; Rossendale, Witchford, Ely; Horse & Gate Street, Fen Drayton; High Street, Grunty Fen, Broad Lane; Station Road, Wilburton, Ely; Albion House, Church End, Over (Nov. 16).

Derbys. Green Farm, Old Chillington, Chesterfield (Nov. 11); Whitehouse Farm, Lower Alley, Calow, Chesterfield (Nov. 12); 5, Main Road, Marsh Lane, Eckington; Park Farm, Springhill, Eckington (Nov. 13); 22, Mitchell Street, Clowne, Chesterfield; College Green Farm, Staveley, Chesterfield; Lilac Farm, Palterton, Bolsover, Chesterfield; Hall Farm, Palterton, Bolsover, Chesterfield; 301, High Street, New Whittington, Chesterfield; Holymoor Side, Chesterfield (Nov. 15); 36, Main Street, Palterton, Bolsover, Chesterfield; 44, Main Street, Palterton, Bolsover, Chesterfield (Nov. 16).

Essex. Williams Farm, Stebbing, Dunmow (Nov. 15).

Glos. Rykneild, Weston-sub-Edge, Chipping Campden (Nov. 13).

Herts. Winter Egg Farm, Thriplow, Royston (Nov. 11); Fruit Farm, Fowlmere, Royston; 6, Sheralds Croft Road, Thriplow, Royston; Childrens Playing Field, Thriplow, Royston (Nov 14); Thriplow Manor, Royston; Emsleigh, Stocks Lane, Orwell, Royston; 19, Pipers Close, Fowlmere, Royston (Nov. 15); Thatched Cottage, Church Street, Thriplow, Royston; Grange Farm, Newmarket Road, Heydon, Royston; Bacon Farm, Thriplow, Royston; Rectory Farm, Thriplow, Royston; The Green, Thriplow, Royston; Orchard Farm, Thriplow, Royston; Hill Farm, Much Hadham (Nov. 16).

Hunts. Della's Premises, Pig Lane, St. Ives; Riverview Low Road, St. Ives; Lindsells Farm, Needingworth; 69, Green Leys, St. Ives; 3, Houghton Road, St. Ives; The Jungle, Needingworth Road, St. Ives; South Street, Woodhurst; 12, West Wood Road, St. Ives; Swanweir, Woodhurst (Nov. 10); The Orchard, Badcock Holding, Hemingford Road, St. Ives; Wiggin Hill Farm, St. Ives; Houghton Hill Farm, Houghton, St. Ives; Manauri, High Street, Bluntisham; Hillside, Bluntisham Heath, Bluntisham; Danetree Farm, Needingworth; March Lane, Hemingford Grey; 4, Victoria Terrace, St. Ives; March Lane Farm, Hemingford Grey; Fullards Farm, Woodhurst; Dilkusha, Wiggin Hill, St. Ives (Nov. 11); Hill Farm, Wood Walton; Houghton Poultry Research Station, Houghton Grange, Houghton; Browns Allotments, Pig Lane, St. Ives (Nov. 12); Dockseys Farm, Hemingford Grey; Hill Farm, St. Ives; High Street, Warboys; Rosedene, High Street, Bluntisham (Nov. 13); Monsal, Burleigh Hill, Somersham Road, St. Ives; 13,

Fenton Road, Warboys; The Laurels, Fenton, Warboys; 2, Needingworth Road, St. Ives; The Farm, Needingworth Road, St. Ives; Mill House, High Street, Warboys; The Homestead, South Street, Woodhurst; Waterways Duck Farm, Hemingford-Grey; Old Tiles, Honey Hill, Fenstanton (Nov. 14); Sunnycroft Farm, Pidley; The Hawthorns, Station Road, Warboys; 12, Old Mill Avenue, Warboys; 7, Moot Way, Woodhurst (Nov. 15); 2, The Vieyard, Colne; Pembroke House, Hemingford Grey; Victoria House, Needingworth; York House, Colne; 14, Wellington Street, St. Ives; 27, Old Pound Close, Hemingford Grey (Nov. 16).

Lincs. The Garage, Ermine Street, Ancaster, Grantham; Church Farm, Gautby, Wragby (Nov. 10); The Allotments, Lincoln Road, Ruskington, Sleaford; 11, Arnhem Avenue, Ruskington, Sleaford; Grange Farm, Brauncewell, Wellingore (Nov. 11); 10, Willoughby Road, Boston; 62, High Street, Ruskington, Sleaford (Nov. 13); 48, High Street, Ruskington, Sleaford (Nov. 14); The Waggon & Horses, Caythorpe, Grantham; Anwick, Sleaford (Nov. 15); Welbourne Road, Leadenham (Nov. 16).

Norfolk. 9, Aivey House, Mattishall, Dereham; Hawthorn Cottage, The Street, Erpingham, Norwich (Nov. 10); The Swan, Mattishall, Dereham; Hillside, Harstead, Coltishall, Norwich; Stonehouse, Lyng, Norwich (Nov. 11); White Lodge, St. Faiths, Norwich (Nov. 12).

Northants. The Meadow, Stoke Bruern, Towcester (Nov. 12).

Notts. Eadt Lane, Edwinstowe, Mansfield; Rear of Joke and Brass Inn, East Lane, Edwinstowe, Mansfield (Nov. 14).

Suffolk. American Farm, Combs, Stowmarket (Nov. 10); Hill Cottage, Felsham, Bury St. Edmunds (Nov. 12); Hall Farm, Mellis, Eye (Nov. 14); The Old School, Mellis, Diss (Nov. 16).

Surrey. Boxhill Farm, Dorking (Nov. 10); Coslands Estate, Ewhurst, Cranleigh (Nov. 11); Yarrow, Ewhurst, Cranleigh (Nov. 12); Westlands Farm, Ockley Road, Ewhurst, Cranleigh; Chalk Pit Farm, Little Bookham, Leatherhead (Nov. 13); 270, Farleigh Road, Warlingham (Nov. 15); Woodlands Farm, Woodlands Road, Little Bookham, Leatherhead (Nov. 16).

Sussex. Lunces Hall, Wivelsfield, Haywards Heath (Nov. 10); Stonelands, Herstmonceux, Hailsham (Nov. 14); 7 Oaks, Bodle Street, Hailsham (Nov. 15).

Warwicks. Glebe Farm, Shenton, Nuneaton (Nov. 10); Kingley Farm, Alcester (Nov. 14).

Worcs. Woodview, Throckmorton, Pershore; Smallholding, Main Road, Acton, Stourport (Nov. 11); The Meadows, Evesham Road, Broadway (Nov. 12).

Yorks. Summerley House, Unstone, Sheffield (Nov. 10); 52, Main Avenue, Totley, Sheffield (Nov. 14); Hague Farm, Renishaw, Sheffield; Handley Farm, Middle Handley, Sheffield (Nov. 15); 81, Vale Road, Sheffield, 3 (Nov. 16).

Swine Fever

Anglesey. Bronallt, Rhostrehwfa, Llangefni (Nov. 12).

Berks. Frogmill Farm, Hurley, Maidenhead (Nov. 12).

Carms. Llwyn Farm, Llanelly (Nov. 13).

Ches. Parkgate House, Saughall, Chester (Nov. 11).

Derbys. Fox Coverts Farm, Aston-on-Trent, Derby (Nov. 12).

Devon. Huntsland Farm, Pinhoe, Exeter (Nov. 10); Man's Newton, Zeal Monachorum, Crediton; Kerslake Farm, Yettington, Budleigh Salterton; High Ridge Farm, Kings Nympton, Umberleigh (Nov. 11); Cleave Farm, Whitestone, Exeter (Nov. 12).

Dorset. Parkhouse Farm, Chetnole, Sherborne (Nov. 10); Stickland Farm, East Morden, Wareham (Nov. 16).

Essex. Slough Farm, Debden, Saffron Walden (Nov. 16).

Glam. Allensmoor, Canisland, Parkmill, Swansea (Nov. 10).

Herts. Stocks Farm, Aldbury, Tring (Nov. 12).

Kent. Islingham Farm, Wainscott, Rochester (Nov. 16).

Lancs. Grange Farm, Grange Road, Bromley Cross, Bolton (Nov. 11).

Mont. Tynycwm, Aberhafesp, Newtown; Tyncelyn, Aberhafesp, Newtown (Nov. 12); Rhiwgoch, Llanfair, Caereinion, Welshpool (Nov. 16).

Norfolk. Gordon House, Cromer Road, Aylsham, Norwich; Coronation Farm, Mileham, Kings Lynn (Nov. 12).

Notts. Camston Lane, Camston, Radcliffe-on-Trent (Nov. 12).

Salop. Wood Lane Farm, Wollerton, Market Drayton (Nov. 11).

Somerset. Key Farm, East Coker, Yeovil; Glendale, Eldon Road, Worle, Weston-super-Mare (Nov. 10); Camelhill Farm, Queen Camel, Yeovil; Pyrland Farm, Taunton (Nov. 16).

Suffolk. Giffords Hall, Wickham Brook, Newmarket (Nov. 10); The Green, Badwell Ash, Bury St. Edmunds; Brewery Farm, Stonham Parva, Stonham, Stowmarket (Nov. 11).

Surrey. Gosden Hill Farm, Merrow Lane, Guildford (Nov. 10); Moat Farm, Reigate Road, Hookwood, Horley (Nov. 16).

Sussex. Starlock, Playden, Rye (Nov. 13).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Progesterone and Pyometra in the Cow

Sir,—In the course of an investigation into the use of progesterone and of 17-alpha-hydroxyprogesterone-capronate, a "long-acting progesterone," in the diagnosis, prognosis and cure of the bovine cystic ovary complex, I have met 6 cases of pyometra over the last 2 years which have cleared when given either 100 mg. progesterone daily intramuscularly for 3 days or one intramuscular injection of 500 mg. of the long-acting derivative. In each case the discharge has been muco-purulent and associated with an anoestrous ovary rather than the more fluid purulent discharge associated with a persistent corpus luteum which responds to enucleation or oestrogen treatment.

Case 1—When first seen this animal was treated with stilboestrol, and later, when the stilboestrol was seen to be aggravating the condition, with chorionic gonadotrophin (L.H.). Later she was treated with larger doses of stilboestrol by another veterinary surgeon still unsuccessfully. She was then sold. A few months later she reappeared on another farm—identified *per rectum* by a characteristic pelvis (checked by earmark later). Progesterone was given experimentally, since the drug was conveniently available, despite the knowledge that she was soon to be slaughtered. She was re-examined on the eighth day when the condition was found cleared. No regular oestrous cycle was re-established within the 3 months before slaughter—not very surprising considering the amount of stilboestrol administered.

Case 2—This animal was first treated with stilboestrol which appeared to aggravate the condition. Progesterone was then used. On the eighth day she was re-examined and the condition found cleared. Her uterus was irrigated with oxytetracycline*. She was missed when next in oestrus and held to

* Terramycin.

service at the following oestrus. She has since calved.

Case 3—This animal was treated with 17-alpha-hydroxy-progesterone-capronate. The condition had cleared within a week, but she was culled for low production and slaughtered.

Case 4—This animal was treated with 17-alpha-hydroxy-progesterone-capronate. The condition had cleared by the eighth day when she was re-examined and irrigated with oxytetracycline. She was in oestrus 6 days later, missed and held to service at the following one. She has since calved.

Case 5—This animal was treated with 17-alpha-hydroxy-progesterone-capronate. The condition had not cleared by the third day, but had by the eighth day when she was irrigated with oxytetracycline. She was in oestrus a week later, served, returned at 20 days, was served again and is now in calf.

Case 6—This animal was treated with 17-alpha-hydroxy-progesterone-capronate. The condition had cleared by the eighth day when she was irrigated with oxytetracycline. She returned to service at the first oestrus after treatment but held at the second and is now in calf.

Since pyometras of any sort are relatively uncommon, and since oestrogens appear to be contra-indicated in this type, I have recorded the successful treatment of only 6 cases.

Yours faithfully,

12 Landguard Road, C. M. GOULD.
Southampton.

November 16th, 1959.

Twin Calving

Sir,—On page 812 of THE VETERINARY RECORD for November 7th, reference is made to an arrangement whereby a senior officer of the M.M.B. is to give us a detailed report on their twin-calving experiment.

May I suggest that, in return, B.V.A. members could add to the pool of information by reporting on experiences of twin-calvings under ordinary conditions? Discussion with a number of colleagues has revealed a concern over possible unfavourable results especially in older cows, and has prompted the recording of results in a small calf-rearing beef herd eligible for upland cattle subsidy. Some of the cows are outwintered with an artificial shelter for really rough weather; others are housed. The level of hand feeding is well above average for the type of enterprise.

Twinning has occurred 3 times in the past 6 years.

1. *8-year-old polled cow in good condition.* Late spring calver at approximately normal term after outwintering. Assisted calving. One calf decomposing. Other smallish but successfully suckled by cow after recovery from retained cleansing and metritis. Cow mated and housed during following winter. Calved a single calf. Did badly and died some 6 weeks later.

2. *12-year-old Shorthorn cow of large size.* April calver at normal term after outwintering. With assistance calved 2 bulls of average size. Developed severe ketosis but suckled one of the calves and improved during the summer. Mated, housed, and given special care but aborted twins at about 7 months. Died 4 weeks afterwards despite very careful nursing.

Further case. Aged Ayrshire cow of top class. Spring calver. In a neighbour's herd calved twin bulls of good size but so badly shaken that she was unfit for milking. Taken in hand, she responded to much more attention than could be justified economically, suckled a calf, was mated, and subsequently calved a single calf and milked well.

Undoubtedly this experience is too bad to be normal, but one breeder to whom I spoke, voiced the opinion that it might be more useful if we searched for some way of preventing twinning in cows.

Yours faithfully,

Veterinary Department, JOHN C. GRANT.
Marischal College,
Aberdeen.

November 11th, 1959.

Extra-uterine Foetus in a Ewe

Sir,—I have read with interest the articles by Ashdown and Marrable (*Vet. Rec.* **71.** 810) and Wilson (*Vet. Rec.* **71.** 836) on cases of extra-uterine pregnancy.

Last spring I encountered the following case. A ewe which had a single day-old lamb was presented for examination. It was found to be dull, febrile and to have a large swelling on the left flank which was diagnosed as a hernia. On questioning the owner it became apparent that this swelling had been noticeable since the ewe had broken over a bank four weeks previously. Vaginal examination revealed an almost closed cervix through which passed a length of placental membranes. On gentle traction these appeared to be attached firmly. A very tentative diagnosis of an extra-uterine lamb was made.

The ewe was given 600,000 I.U. procaine penicillin intramuscularly and the next day a caesarean operation was performed, under paravertebral anaesthesia, using an incision over the hernia. A mummified foetus was found lying ventrally and slightly to the left of the mid-line surrounded by considerable adhesions, with the covering membranes running up through a tear in the left uterine wall. The foetus and the extra-uterine part of the membranes were removed through the abdominal incision; the intra-uterine part was removed by applying gentle traction to the membranes found in the vagina. The uterine tear was sutured, the hernia repaired and the skin incision closed using Michel clips.

The animal received 600,000 I.U. procaine penicillin intramuscularly every 24 hours for 5 days. She reared the single lamb unaided and was subsequently slaughtered fat later in the year.

Yours faithfully,

C. B. TURNER.

The Tors,
Lapford,
Crediton,
Devon.

November 17th, 1959.

The Colonial Veterinary Service

Sir,—Since the letter from Mr. Earnshaw published on October 3rd was addressed on board the M.V. *Aureol* he is presumably on his way out of Nigeria and so able to express himself critically without reference to higher authority.

I am not leaving the Service, but fortunately I do not wish to be so critical. I note that he says that older men are leaving Nigeria; can this be, not that their spirit of adventure is dead, but that they have grown out of it? At forty I no longer wish to spend a month away from home trekking through semi-desert with camels as I did in Somaliland, but it is an experience I would not have missed.

Salaries are in my opinion not so bad. I left general practice in 1949 with a salary of £x to take a salary of £2x in Somaliland, and my gross emoluments are now £4x. The practice I left has grown and prospered but the principal still confesses to working " 25 hours a day, 9 days a week."

The veterinary surgeon in the overseas service must expect and enjoy administrative routine and take a pride in doing it well; it is not difficult. The permeation of politics is a challenge and not half so frustrating as dying of yellow fever, which was what happened to a lot of people in the old days.

I have never worried about lack of policy directives; generally speaking my superior officers have given me a pretty good idea of what they were driving at, and when they did not it has been easy and pleasurable to devise policies of my own—particularly where communications were bad! Clinical work to keep me up to date has never been lacking, and what a relief to treat the case and not the client!

Even so, it is obvious that all is not well. My criticism will come, however, not directly but by quoting again from the principal of my old practice: " What is wrong with Africa these days? We have had about 7 applications for employment from veterinary surgeons there during the last few weeks."

Yours faithfully,
R. G. MARES.

Division of Animal Health,
P.O. Box 1252,
Kumasi,
Ghana.
October 29th, 1959.

Massage of the Ovary

Sir,—In an article by J. G. Wilson entitled " Bovine Abortion in the South-West—The Present Position " (THE VETERINARY RECORD, August 22nd, 1959), I read, under the paragraph heading, Glimpses into the Future: " It has been proved that expression of the corpus luteum from mid-term onwards does not produce abortion, although it may be associated with retained membranes. Actually on more than one occasion I have expressed the corpus luteum associated with a 6-week pregnancy without terminating the pregnancy. From this it would appear that the foetus itself, through its placenta, controls the pregnancy possibly from as early as 6 weeks onwards."

I have been startled indeed by this statement and find it impossible to agree with. For 30 years now I have been massaging ovaries as a routine practice —in hundreds of cases the expression of the corpus luteum was done to induce abortion, and I am still waiting for the first case in which the placenta could take over control of the pregnancy.

I am of the opinion that when such a case seems to occur, it should be checked by an examination of the ovary itself by laparotomy. I remember such a case when one young veterinarian under my supervision thought that he had expressed the corpus luteum from the ovary of an Ayrshire cow, the owner of which had requested him to abort the cow because of an out-of-season mating. As we could not reach the ovary *per rectum* because of an advanced pregnancy, we performed a laparotomy and found the corpus luteum still in place; this was then expressed and removed from the abdomen. The cow immediately started to " spring," and 17 days later, aborted a 42-lb. foetus.

On other occasions, I have been called to check ovarian massages which have been particularly difficult. I must confess that in many cases the well-massaged ovary still held the corpus luteum and that it was impossible to express it because in such circumstances the envelope of both ovary and corpus luteum seems to increase its resistance to rupture, becoming both thickened and slack at once. In such a case, a laparotomy must be done as a last resort to ensure an abortion.

The time between the expression of the corpus luteum and the abortion of the cow varies considerably. In the first few months of pregnancy it is generally only a matter of a few days. I have massaged *per rectum* the ovaries of many cows about 7 months pregnant, and in most cases abortion occurs after a period of 12 to 17 days. On the other hand, I once had an 8-months pregnant heifer abort after 24 hours.

In late pregnancy it is often very difficult to grasp the ovary, due to the fact that even if one's arm is long enough, the rectal mesentery may be too short. In such cases laparotomy is necessary. This is done through the appropriate flank after an examination *per rectum* to determine in which uterine horn the foetus lies. In one case, the cow aborted one foetus a few days after expression of a corpus luteum, but did not come back in season, and delivered a second calf at the due date. Since this experience, both ovaries are always checked to eliminate the possibility of a twin pregnancy.

It should be borne in mind that as pregnancy progresses, the size of the ovary itself decreases. A real atrophy of the ovarian tissue occurs without affecting the corpus luteum, so that the whole ovary-corpus luteum complex appears to the touch as a single unit without demarcation. The feel of the ovary might thus be misleading unless a laparotomy is performed. Even then, enucleation of the corpus luteum is not always easy, this body being sometimes of a spongy nature so that it may be found necessary to stretch it for 1 to 3 inches, still within its enveloping membrane, in the process of scraping it off the ovary. The difficulty encountered in enucleation

has led me to develop the following technique which is particularly useful in advanced stages of pregnancy:—

The ovary-corpus luteum combination which can be found under the tensely stretched free edge of the broad ligament is grasped with the fingers and pulled forwards and upwards, and then back to the dorsal surface of the ligament. Then the utero-ovarian ligament is held in the palm of the hand, with the ovary and corpus luteum between the thumb and fore-finger. Pressure is applied with the thumb to the ovary as the whole complex is lifted upwards in the hand. The corpus luteum is then easily separated from the ovary, and released into the peritoneal cavity.

To add strength to my views I have also spayed dozens of old cows with the aim of fattening them for the butchery, regardless of whether they were pregnant or not. Within this group were many cows which were up to 5 months pregnant; all of these, without exception, lost their calves after spaying.

The same situation arises when the pregnant bitch is spayed in such cases as those following mesalliance. Ovariectomy by itself has led, in *all* cases in my experience, to abortion within 24 hours.

I would be most interested if other practitioners could help to confirm my conclusions on this question, which seems to me to be so clear cut and indisputable in its study and application in the field.

Yours faithfully,

Y. PINCEMIN,
Senior Veterinarian.

The Kaitaia Co-operative Dairy Company Limited,
Kaitaia,
New Zealand.
October 30th, 1959.

Displacement of the Abomasum in the Ewe

Sir,—Though displacement of the abomasum in the cow has become a well-recognised clinical entity, the condition has not, to our knowledge, been recorded in the ewe. While examining ewes affected with pregnancy toxaemia, clinical examination led us to suspect displacement of the abomasum and we were able to confirm this by laparotomy. Difficulty has always been experienced in detecting rumenal motility in pregnancy toxaemia, and more recently location of the organ by direct needle puncture in the left sub-lumbar fossa was also found difficult. In a half-bred ewe affected with pregnancy toxaemia we detected tympanitic and fluid sounds in the left upper abdomen under the last few ribs. Percussion in this region revealed an area of abnormal resonance, which extended back into the sub-lumbar fossa. A left flank laparotomy in the sub-lumbar fossa confirmed the diagnosis of displacement of the abomasum. The distended fundic portion of the organ lay to the left of the rumen and extended upwards and backwards into the middle of the sub-lumbar fossa. The rumen was pushed upwards and forwards to the right by the gravid left uterine horn.

Lagerlof (1929) found that in advanced pregnancy in the cow the uterus displaced and compressed the abomasum in a forward direction, the fundic portion being pushed to the left of the median plane. While performing caesarean section on full-term ewes, the abomasum has frequently been seen on the left of the abdomen between the rumen and the abdominal wall, in a variety of positions, apparently dictated by the degree of its distension.

The position of the abomasum in the normal pregnant ewe, the cause of its displacement, and the association of the latter with pregnancy toxaemia appear to merit investigation.

Yours faithfully,

J. A. FRASER,
P. IMLAH,
E. A. McPHERSON.

Royal (Dick) School of Veterinary Studies,
Edinburgh, 9.
November 7th, 1959.

Reference

LAGERLOF, N. (1929). *Skand. Vet. Tidskr.* **19**. 253.

Transport of Wild Animals

Sir,—Two important letters published in THE RECORD under the above heading on November 7th and 14th relate to the importation of monkeys on a large scale for the manufacture and testing of poliomyelitis vaccine.

Mr. C. T. Murphy, M.R.C.V.S., has very kindly been going into this problem on behalf of UFAW and has been accorded all requisite facilities both at London Airport and by pharmaceutical firms. Naturally his reports are in part confidential, but the following information extracted from them may be of interest to your readers.

These monkeys no longer come to this country by sea, except in the entrepôt trade. All these come to stay. They now come by air under conditions agreed upon by British air lines in collaboration with a technical subcommittee of the British Standards Institution, on which UFAW is represented by Mr. Murphy. Members of this subcommittee now periodically travel with consignments of monkeys. Its recommendations are published under the title "Carriage of Live Animals by Air; Monkeys for Laboratory Use." B.S. 3149. Part 1. 1959. Price 4s. from the British Standards Institution, 2, Park Street, London. W.1.

A great gain in humaneness would be achieved if all countries would decide to import all their monkeys by air, and if all air lines would agree to adopt the recommended conditions of transport under adequate control.

In this country at the receiving end of the trade the conditions do now seem to be well under control, but unfortunately this cannot be said of conditions at the export end. Some of these conditions are exposed in Mr. Wright's disturbing letter published in last week's RECORD.

Yours faithfully,

C. W. HUME,
Secretary-General of UFAW.

The Universities Federation for Animal Welfare,
7a, Lamb's Conduit Passage,
London. W.C.1.
November 17th, 1959.